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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,780	09/27/2005	Tetsuya Taki	PTGF-04041US	9224

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EXAMINER	
GOODWIN, DAVID J	

ART UNIT	PAPER NUMBER
2818	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,780	TAKI, TETSUYA	
	Examiner	Art Unit	
	David Goodwin	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 3, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamamoto (US 6,064,079).

3. Regarding claim 1.

4. Yamamoto teaches a group III nitride based semiconductor device (column 1 lines 45-60). Said device comprises a first p-layer (15, 16) and a second p-layer (16, 18) to each of which an acceptor impurity is added (column 5 lines 15-25). An intermediate layer (17, 34) is provided between and in contact with the first p layer and the second p layer (column 5 lines 25-40). The intermediate layer (17, 34) is doped with a donor impurity concentration (column 5 lines 25-55).

5. The concentration of donor impurity willl inherently have a relation to the activation rates of the acceptor and donor impurities and also the temperature of the device.

6. The limitation must distinguish from the prior art in terms of structure rather than function, *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997); See also *In re Swinehart*, 439 F.2d210, 212-13, 169 USPQ 226, 228-29 (CCPA

1971). Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F. 2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F. 2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

7. Regarding claim 2.

8. Yamamoto teaches the donor impurity doped into the intermediate layer is doped with a concentration distribution corresponding to a concentration distribution of the acceptor impurity in the intermediate layer (fig 2B) (column 5 lines 35-60).

9. Regarding claim 3.

10. Yamamoto teaches the acceptor impurity is magnesium and the donor impurity is silicon (column 5 lines 10-45).

11. Regarding claim 6.

12. Yamamoto teaches the first p layer (15) includes a p cladding layer (15) made of p type AlGaN doped with Mg (column 5 lines 10-25). The second p-layer (18) includes a p contact layer (18) made of p type GaN doped with Mg (column 5 lines 10-30).

13.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto (US 6,064,079) as applied to claim 1 above and further in view of Fukuda (JP2003-115610).

16. Regarding claim 4.

17. Yamamoto teaches elements of the claimed invention above in the rejection of claim 1.

18. Yamamoto does not teach the relative concentrations of the dopants.

19. Fukuda teaches a group III nitride semiconductor device. Said device comprises intermediate layers having concentration of Mg dopant of 1E18/cm^3 and intermediate layers having silicon dopant concentration of 1E17/cm^3 (translation paragraphs 0010-0015). The ~~ration~~ ratio of which is 10 to 1.

20. It would have been obvious to one of ordinary skill in the art to dope the intermediate layer with these concentrations in order to reduce current leakage without affecting the crystal structure.

21. Regarding claim 5.

22. The above concentrations of dopants will result in a hole density of 10^17/cm^3.

23.

24. Claims 7 through 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto (US 6,064,079) in view of Kaneyama (US 2002/0014632.

25.

26. Regarding claim 7.

27. Yamamoto teaches that a group III nitride semiconductor device is formed on a sapphire substrate (10) (column 5 lines 15-25). An n contact layer (12) formed on the sapphire substrate (10) (column 4 lines 30-40). An n cladding layer (13) formed on the n contact layer (12) (column 4 lines 30-45). A light emitting layer (14) formed on the n cladding layer (13) (column 4 lines 30-50). A p cladding layer (15, 16) and a p type contact layer (16, 18) to each of which an acceptor impurity is added (column 5 lines 15-45). An intermediate layer 17, 34) provided between the p cladding layer (15) and the p contact layer (18). A p electrode (22) is disposed on the p contact layer (18). An n electrode (21) disposed on the n contact layer (12). The intermediate layer (17, 34) is doped with a donor impurity concentration (column 5 lines 25-55).

28. The concentration of donor impurity willl inherently have a relation to the activation rates of the acceptor and donor impurities and also the temperature of the device.

29. The limitation must distinguish from the prior art in terms of structure rather than function, *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997); See also *In re Swinehart*, 439 F.2d210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971). Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F. 2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F. 2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

30. Yamamoto does not teach that the p electrode comprises a thin film electrode and a thick film electrode.

31. Kaneyama teaches group III nitride semiconductor device comprises a contact layer (109). A thin film electrode (110) is disposed on said contact layer (109). A thick film electrode (120) is disposed on the thin film electrode (109) (fig 1) (paragraph 0036-0039).

32. It would have been obvious to one of ordinary skill in the art to form an electrode of a thin film and a thick film in order to form a good electrical connection without blocking the emitted light.

33. Regarding claim 8.

34. Yamamoto teaches that the light emitting includes a multiquantum well structure (14) formed on the n cladding layer (13) by laminating multiple pairs of well layers of undoped InGaN and barrier layer of undoped GaN (column 4 lines 25-45).

35. Regarding claim 9.

36. Kaneyama teaches group III nitride semiconductor device comprises a contact layer (109). A thin film electrode (110) is disposed on said contact layer (109). Said thin film electrode (110) is formed of a layer of cobalt (111) and a second layer of gold (112) (paragraph 0038). A thick film p electrode (120) is disposed on the thin film electrode (109) (fig 1) (paragraph 0036-0039). Said thick film p electrode is formed by laminating a first layer of vanadium (121), a second layer of gold (122), and a third layer aluminum (123) sequence on the thin film p electrode (110) (paragraph 0039).

37. It would have been obvious to one of ordinary skill in the art to form an electrode of a thin film and a thick film in order to form a good electrical connection without blocking the emitted light.

38. Regarding claim 10.

39. Kaneyama teaches a reflective metal layer (150) of aluminum formed on the sapphire substrate (101) (paragraph 0040).

40. It would have been obvious to one of ordinary skill in the art to form a reflective metal layer in order to direct all emitted light in one direction thereby increasing the efficiency of the device.

41. Claims 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto (US 6,064,079) as applied to claim 1 above and further in view of Fukuda (JP2003-115610).

42. Regarding claim 11.

43. Yamamoto teaches elements of the claimed invention above in the rejection of claim 1.

44. Yamamoto further teaches that the intermediate layer (17, 34) has a high resistivity.

45. Yamamoto does not teach the relative concentrations of the dopants.

46. Fukuda teaches a group III nitride semiconductor device. Said device comprises intermediate layers having concentration of Mg dopant of 1E18/cm^3 and intermediate layers having silicon dopant concentration of 1E17/cm^3 (translation paragraphs 0010-0015). The ratio of which is 10 to 1.

47. Further, an amount of donor impurity will inherently offset an amount of acceptor impurity.

48. It would have been obvious to one of ordinary skill in the art to dope the intermediate layer with these concentrations in order to reduce current leakage without affecting the crystal structure.

49. The limitation must distinguish from the prior art in terms of structure rather than function, *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997); See also *In re Swinehart*, 439 F.2d210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971). Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F. 2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.,* 909 F. 2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

50. Regarding claim 12.

51. Fukuda teaches that the intermediate layer (11) is about 100 nm (table 1).

52. It would have been obvious to one of ordinary skill in the art to form an intermediate layer of about 100 nm in order to

53. Regarding claim 13.

54. Yamamoto does not teach the relative concentrations of the dopants.

55. Fukuda teaches a group III nitride semiconductor device. Said device comprises intermediate layers having concentration of Mg dopant of 1E18/cm^3 and intermediate

layers having silicon dopant concentration of 1E17/cm^3 (translation paragraphs 0010-0015). The ratio of which is 10 to 1.

56. It would have been obvious to one of ordinary skill in the art to dope the intermediate layer with these concentrations in order to reduce current leakage without affecting the crystal structure.

57. Regarding claim 14.

58. Fukuda teaches a group III nitride semiconductor device. Said device comprises intermediate layers having concentration of Mg dopant of 1E18/cm^3 and intermediate layers having silicon dopant concentration of 1E17/cm^3 (translation paragraphs 0010-0015). This results in the donor and acceptor activation rates being substantially equal.

59. It would have been obvious to one of ordinary skill in the art to dope the intermediate layer with these concentrations in order to reduce current leakage without affecting the crystal structure.

Response to Arguments

60. Applicant's arguments filed 5/8/07 have been fully considered but they are not persuasive.

61. Applicant's arguments with respect to claims 1 through 11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Goodwin whose telephone number is (571)272-8451. The examiner can normally be reached on Monday through Friday, 9:00am through 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke can be reached on (571)272-1657. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DJG

Steven Loke
Supervisory Patent Examiner
Steven Loke